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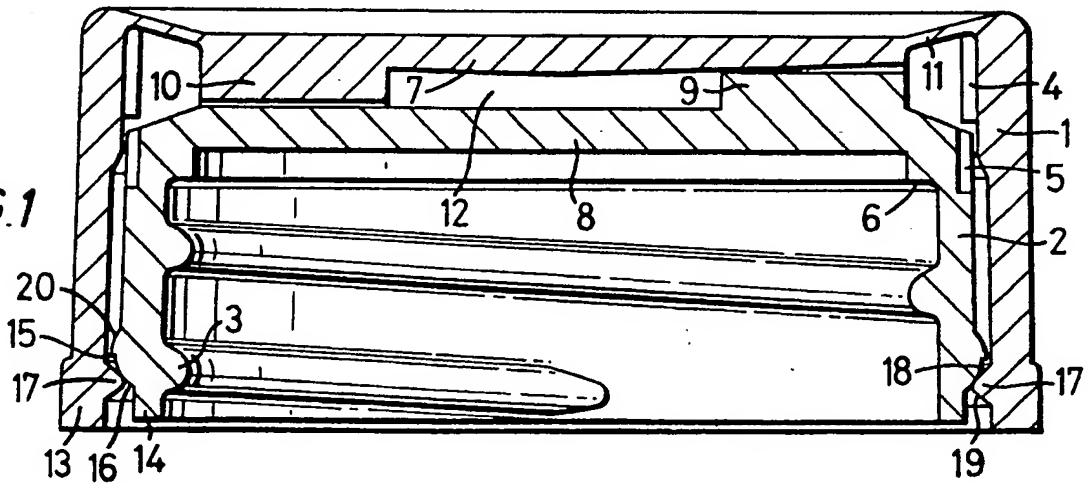
(54) Safety closure with click mechanism

(57) A safety closure comprises an outer closure member (1) and an inner closure member (2) having crown portions (7 and 8) respectively. The skirt portion of the inner closure member (2) is provided with an outwardly convex surface (16), while the skirt portion of the outer closure (1) is provided with a plain vertex (17). Two engageable splines (4 and 5) are provided and the inner and outer closure members will normally rotate relative to each other without interengagement. To remove the closure an axial force is applied together with a radial force which causes vertex (17) to slide down surface (16). The splines are thereby engaged using a reduced axial force. Pawl and ratchet means (9 and 10) disposed on the respective crown portions of the closure members provide clicking sounds and provide means biassing the closure members apart. Without separate biassing means an improved sounding box is provided.

FIG.1



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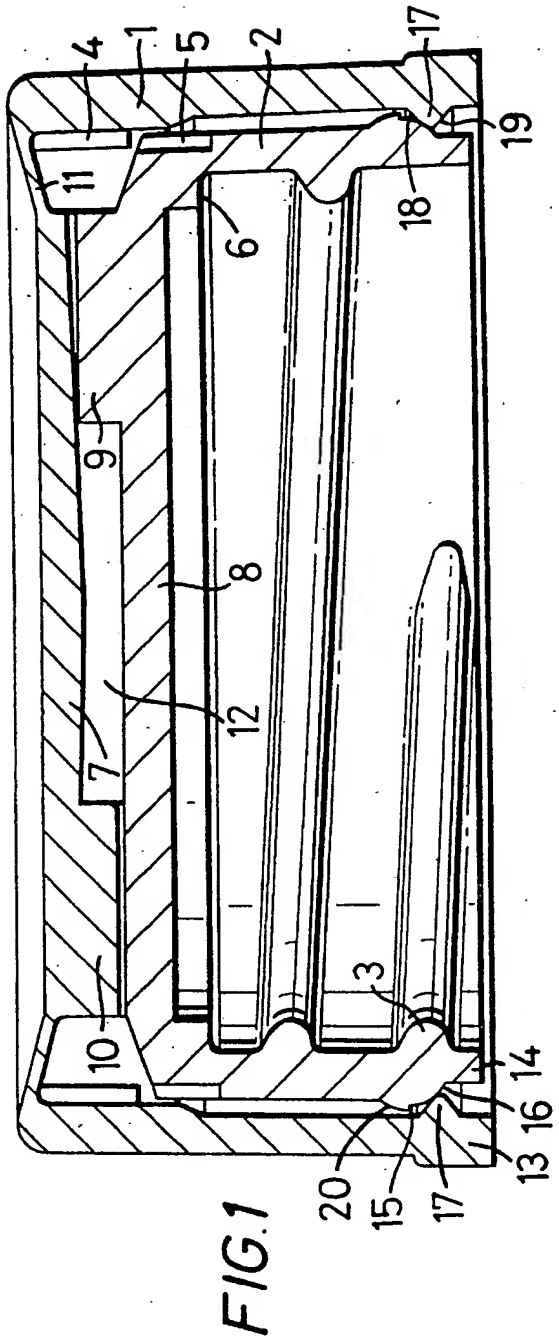


FIG.1

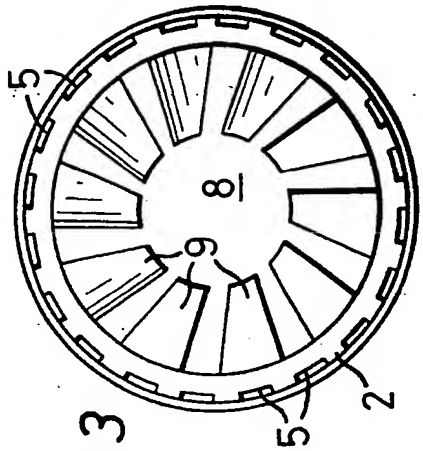


FIG.3

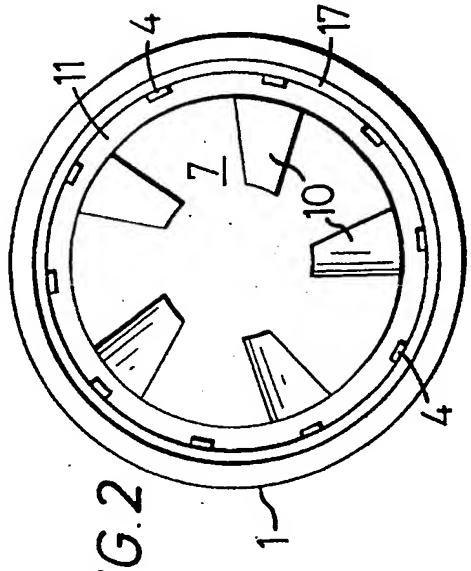
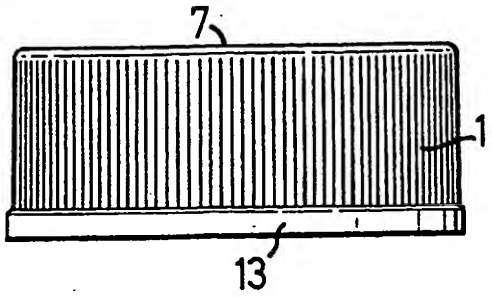


FIG.2

FIG.4



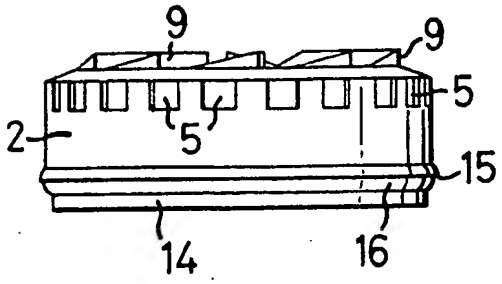
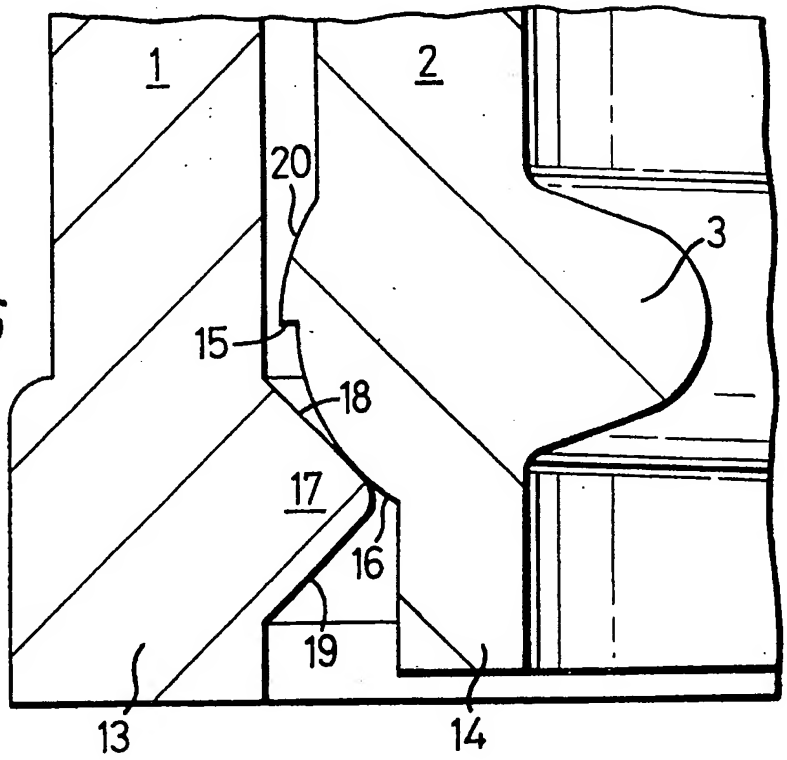


FIG.5

FIG.6



SPECIFICATION

Saf ty l sure

The present invention relates to a safety closure for a container, and particularly to safety closures of the type having inner and outer co-operating members which only interengage for rotation when certain conditions have been met.

It is known to provide containers with a safety closure assembly in the form of a double closure member, each assembly comprising an inner closure member within an outer closure member, the inner closure member being arranged to close the dispensing aperture of the container. Such a safety closure assembly may be used for containers intended to contain medicine and other pharmaceutical products; and the inner closure member is arranged to be removed from the container only by applying to the outer closure member a movement which is beyond the capacity of a child. In this manner, access to the contents of the container is made more difficult, thus, reducing its accessability to children.

In our British Patent No: 1 602 612 there is described, generally, a safety closure assembly for a container having a dispensing opening. Said assembly comprises an inner and an outer closure member, each comprising crown and skirt portions, the inner member being adapted to close said dispensing opening and the outer member being retained on said inner member to allow of relative rotation therebetween in a disengaged position, interengagement means provided between said members to lock said members together for common rotation about the dispensing opening, the assembly being so arranged that the crown portion of the outer closure member is resilient and is normally spaced to a disengaged position, but may be moved to a interengaged position by an axial force exerted on the crown of the outer member which exceeds the resilient forces inherent in said outer member.

The present invention relates in a first aspect to an improvement in assemblies of this type wherein radially applied forces assist, or replace the axial force to cause interengagement of the inner and outer member.

Accordingly, in one aspect of the present invention there is provided a safety closure assembly of the type just described, characterized in that co-operable inclined surfaces are provided between the skirt portions of the closure members, said surfaces being arranged such that a radially applied force tends to move the outer closure member axially relative to the inner closure member, thereby at least, to assist in interengagement.

Preferably the inner closure member is provided with a convexed inclined plane, which may t rminate toward its uppermost portion in a d tent, adapted to discourag dismantling of the inner and outer closure members. This detent has the same effect as a retaining means c mmon in the skirt of closures of the type. The inclined plane of the outer closure member may be a plain vertex.

Further, in our British Patent No: 1 620 611, there is also provided a safety closure assembly for a container having a dispensing opening, said assembly comprising an inner closure member adapted to close said dispensing opening, an outer closure member adapted to receive said inner closure member therein and formed with a resilient crown portion adapted to be disposed about the inner closure member on assembly, thereby to bias the inner and outer closure members to a disengaged condition, retaining means provided between the inner closure member and the outer closure member, whereby the inner closure member is retained within the outer member for relative rotation with respect thereto, interengagement means provided between the inner closure member and outer closure member, whereby the inner closure member and the outer closure member rotate together, wherein torque between the inner and outer closure members for removal of the inner closure member from the container is achieved by moving the outer closure member against the bias of the outer crown to remove inter engagement means into an engaged condition,and wherein one of said crowns further carries a yieldable abutment element adapted for complimentary engagement with a yieldable abutment element carried on the face of the other of said crowns, whereby relative rotation between said members causes the yieldable abutment elements to ride over one another and to emit an audible indication of said relative rotation.

The present invention relates, therefore, in a second aspect to improvements of the safety closures of this latter type, which are characterized in that the outer crown is biased to the disengaged condition by said yieldable abutment elements. This arrangement allows the separate biassing means previously required to be dispensed with.

The complimentary abutment elements may comprise ratchet means, whereby said relative rotation is in one direction only.

The ratchet means may comprise pawl members provided on the outer crown and ratchet teeth members provided on the outer upper surface of the inner crown, or vise versa. Pawl members may each be spaced an equal distance from adjacent pawl members in a circumferential direction of the outer closure member.

Pr ferably, there are provided five pawl members and 10 ratchet members on the inner closure member. The r silient crown portion may be dished if desired, but requires

no centrally inwardly projecting blister.

The said outer crown may carry the said pawl members and serve simultaneously as a more efficient diaphragm to amplify the audible indication produced by th pawl m mbers riding over the teeth members. The inner and outer closure members may be formed of a resilient plastics material such as, for example, a high density polyethylene.

The crown of the outer member, which may be dished if desired, may terminate toward its periphery in an annular connecting portion, connecting the crown to the skirt. Said annular portion may be of increased flexibility to assist axial, and/or partial pivotal motion of the outer closure member. This increased flexibility may be achieved by reducing the thickness of said annular portion.

The invention will now be described, by way of illustration only, with reference to the accompanying drawings wherein Figure 1 shows a vertical cross section through an assembled closure member in accordance with the invention,

Figure 2 shows a plan view from below of a outer closure member of Figure 1;

Figure 3 shows a plan view from above of an inner closure member in accordance with Figure 1;

Figure 4 shows a side view of the assembled closure member;

Figure 5 is a side view of the inner closure member of Figure 1, and

Figure 6 is a partial vertical cross section of the lower skirt portions of the inner and outer members in interengagement.

With particular reference to Figure 1, the closure assembly in accordance with the invention is provided by inner and outer closure members; the outer closure being provided with an outer skirt 1, and crown portion 7, the inner closure member being provided with an inner skirt 2 and an inner crown 8. Disposed at the upper, inner periphery of the outer closure member are a series of splines 4, adapted for co-operation with a series of co-operating splines 5 disposed on the upper outer periphery of the skirt 2 of the inner closure member.

The outer skirt 1 is provided on its external surface with a knurled surface, show best in Figure 4, terminating at its lower edge in a reinforced rim 13, The outer crown portion 7 is somewhat dished, being provided, in its central peripheral portion, with a substantially flat disc, terminating toward its periphery in upwardly and outwardly flared flexing annulus 11 of reduced cross section. The annulus 11 terminates at its outer periphery at the uppermost portion of the depending skirt 1. Disposed on the underside of the substantially flat disc portion 7 of the outer crown are fiv equally spaced pawls 10, which depend downwardly. The pawls 10 are so spaced as to leave disc portions 7 free of impediment.

Commensurately, the upper surface of the inner crown 8 is provided (as best shown in Figure 3) with ten ratchet teeth 9 for interengagement with pawls 10. Again, it will be noted that the ratchet teeth 9 are so spaced as to provide segments of the upper surface of the crown 8 without impediment. In its normal orientation the ratchet teeth 9 and the pawls 10 are so arranged that their remote edges which, in use,abut the respective undersides of the adjacent crown, lie in the free spaces between the adjacent pawls or teeth respectively, so the outer closure member effectively rests via the pawls and ratchet teeth upon the inner closure member 8.

With particular reference to Figure 6, the lower portion of the respective skirts 1 and 2 can be seen to be provided with terminating portions 13 and 14 respectively. The outer skirt 1 is provided on its internal face with an inwardly directed vertex 17 which has a substantially triangular cross section being provided on its upwardly inclined face 18 and its downwardly directed face 19, substantially planar contact portions extending about the inner face of the outer closure as an annulus.

The inner closure member is provided on its inner face with screw thread portion 3, adapted in use to co-operate with a corresponding screw thread on the container to which the closure is to be applied. On the outer surface of the inner skirt a generally convex contact surface is provided. This surface is divided into an upper contact surface 20, a detent 15 and a lower contact surface 16, the surfaces 20 and 16 being convex with the detent 15 extending substantially at right-angles to the skirts.

In operation, and with particular reference to Figure 6, it will be appreciated that the outer closure member and the inner closure member are separately moulded and subsequently conjoined by axially pressing the outer closure member over the inner closure member until the vertex 17 reaches the point on the outer peripher of the inner skirt immediately above the upper concave surface 20. The lower free vertex surface 19 slides down the outwardly directed surface 20, thereby expanding the lower periphery of the outer closure member and contracting the lower periphery 14 of the inner closure member 2. The vertex 17 eventually reaches the detent 15 whereupon it snaps into semipermanent interengagement, thereby holding the closure members together. The inner closure member may be gripped at 14 and forced to separate from the outer closure member, but this can not usually be effected manually. The vertex 17 slides down the lower convexly inclined face 16 to a point at which the inner and outer closure members are firmly in interengagement, wherein the splines 4 and 5 are fully disengaged. In this condition the outer closure member will rotate relative to the

inner closure member without tending to disengage the thread 3 from the corresponding thread on the neck of a container. Thus, the first portion of movement in the axial direction of the vertex 17 relative to the surface 16 takes up any play between the inner and outer closure members without tending to engage the splines 4 and 5.

In use the surface of the outer closure member 1 as shown in Figure 4, particularly, is gripped and hence periphery 13 will tend to deform inwardly. It does not, of course, deform inwardly throughout its entire radius, it is conditioned only that it deforms at one or two places, causing the outer closure member to become slightly eliptical. This has the effect or moving the vertex 17 downwardly, relative to the surface 16, until eventually the vertex 17 meets the periphey of the portion 14 of the inner closure 2. This has the effect of partially rotating a portion 11 so as to bring the splines 4 and 5 into, or toward engagement.

Accordingly, although some axial force is necessary, in addition to the radial force applied by squeezing the outer closure member, the amount of axial force required is somewhat less than would ordinarily be required.

It will be appreciated that since it is necessary to grip the outer peripheral surface of the outer closure member in order to rotate the same, by utilization of the process of the present invention this gripping force can be utilized to reduce the amount of axial force previously required to be applied.

A second aspect of this invention relates to the interrelation of the ratchet and pawl members. If the outer closure member is gripped, for example by a child, the amount of force capable of being exerted by by the child will be insufficient to cause the inter-engagement of the splines 4 and 5. Accordingly, the ratchet teeth 9 and pawls 10 will move over each other thereby giving an audible indication to an adult. Previously separate biassing means had to be provided between the upper and lower crown portions of the closure members. In the present assembly, such are omitted thereby providing a sound box 12 which increases the volume of the sound which is given off by relative rotation. Since the pawls 10 and the ratchet teeth 9 lie between each alternate respective one in a normal condition, the lower periphey of the pawl 10 and the upper periphey of the ratchet teeth 9 will contact the respective surfaces of the crowns 7 and 8. As rotation occurs as between the inner and outer closure members but without interengagement of the splin s 4 and 5, vertex 17 will tend to move upwardly toward the detent 15, particularly if the closure member is held toward the upper portion of the closure members as seen in Figur 1.

Accordingly, the splines 4 and 5 ar forced out of engagement by the relative rotation to further reduce the possibility of a child being able to open th closure member.

Accordingly, the present invention relates both separately and in combination to th features associated with the crown portions and the features associated with the lower portions of the skirts respectively relates to closure members per se, and to assemblies of the closures with containers and to a method of utilizing radial inward pressure to cause axial engagement of splines in closures of this type.

CLAIMS

1. A safety closure assembly for a container having a dispensing opening, said assembly comprising an inner and an outer closure member, each comprising crown and skirt portions, the inner member being adapted to close said dispensing opening and the outer member being retained on said inner member to allow of relative rotation therebetween in a disengaged position, interengagement means provided between said members to lock said members together for common rotation about the dispensing opening, the assembly being so arranged that the crown portion of the outer closure member is resilient and is normally spaced to a disengaged position, but may be moved to an interengaged position by an axial force exerted on the crown of the outer member which exceeds the resilient forces inherent in said outer member, characterized in that radially applied forces assist, or replace, the axial force to cause interengagement of the inner and outer closure member.

2. A closure according to claim 1 characterized in that co-operable inclined surfaces are provided between the skirt portions of the closure members, said surfaces being arranged such that the radially applied force tends to move the outer closure member axially relative to the inner closure member, thereby at least to assist in interengagement.

3. A closure according to either of claims 1 or 2 characterized in that the inclined surface of the inner closure member is a convex inclined plane.

4. A closure according to any preceding claim wherein the closure members are provided with a detent adapted to discourage disengagement of the inner and outer closure members.

5. A closure according to any of claims 2 to 4 wherein the inclined surface of the outer closure member is a plain vertex.

6. A safety closure assembly for a container having a dispensing opening, said assembly comprising an inner closure member adapted to close said dispensing opening, an outer closure member adapted to receive said inner closure member therein and formed with a resilient crown portion adapted to be disposed about the inner closure member on ass mbly, thereby to bias the inner and outer closure

members to a disengag d condition, r taining means provided between the inner closure m mber and the outer closure m mber, whereby the inner closure memb r is retained within the outer member for relative rotation with respect thereto.

interengagement means provided between the inner closure member and outer closure member, whereby the inner closure member and the outer closure member rotate together, wherein torque between the inner and outer closure members for removal of the inner closure member from the container is achieved by moving the outer closure member against the bias of the outer crown to remove inter engagement means into an engaged condition, wherein one of said crowns at least further carries a yieldable abutment element adapted for complimentary engagement with a yieldable abutment element carried on the face of the other of said crowns, whereby relative rotation between said members causes the yieldable abutment elements to ride over one another and to emit an audible indication of said relative rotation, characterized in that the outer crown is biased to the disengaged condition by said yieldable abutment elements.

7. A closure according to claim 6 wherein the complimentary abutment elements comprise ratchet means, whereby said relative rotation is possible in one direction only.

8. A closure according to either claim 6 or claim 7 wherein the ratchet means comprises pawl members provided on the outer crown and ratchet teeth members provided on the outer upper surface of the inner crown, or vice versa.

9. A closure according to any of claims 6 to 8 wherein the pawl and ratchet members are each spaced an equal distance from their adjacent respective members in a circumferential direction of the respective closure member.

10. A closure member according to any of claims 6 to 9 including five pawl members on the outer closure and ten ratchet members on the inner closure.

11. A closure member according to any one of claims 6 to 10, wherein the crown of the outer member terminates toward its periphey in an annular connecting portion, connecting the crown to the skirt, said annular portion being of increased flexibility to assist axial, and/ or partial pivotal motion of the outer closure member.

12. A closure member substantially as hereinbefore set forth with reference to, and/or as illustrated in Figures 1 to 5 or Figure 6 of the accompanying drawings.

CLAIMS

1. A safety closur assembly for a container having a dispensing openinq, said assembly comprising an inner and an outer closure member, ach comprising crown and skirt portions, the inner member being adapted to close said dispensing opening and the outer member being retained on said inner member to allow of r lativ rotation therebetween in a disengaged position, interengagement means provided between said members to lock said members together for common rotation about the dispensing opening, the assembly being so arranged that the crown portion of the outer closure member is resilient and is normally spaced to a disengaged portion, but may be moved to an interengaged position by an axial force exerted on the crown of the outer member which exceeds the resilient forces inherent in said outer member,

characterized in that radially applied forces assist the relative axial movement of the outer closure member to cause interengagement of the inner and outer closure member.

2. A closure according to Claim 1 characterized in that co-operable inclined surfaces are provided between the skirt portions of the closure members, said surfaces being arranged such that the radially applied force tends to move the outer closure member axially relative to the inner closure member, thereby at least to assist in interengagement.

3. A closure according to either of Claims 1 or 2 characterized in that the inclined surface of the inner closure member is a convex inclined plane.

4. A closure according to any preceding claim wherein the closure members are provided with a detent adapted to discourage disengegament of the inner and outer closure members.

5. A closure according to any of claims 2 to 4 wherein the inclined surface of the outer closure member is a plain vertex.

6. A closure according to any preceding claim wherein one of said crowns at least further carries a yieldable abutment element adapted for complimentary engagement with a yieldable abutment element carried on the face of the other of said crowns, whereby relative rotation between said members causes the yieldable abutment elements to ride over one another and to emit an audible indication of said relative rotation, characterized in that the outer crown is biased to the disengaged condition by said yieldable abutment elements.

7. A closure according to Claim 6 wherein the complimentary abutment elements comprise ratchet means, whereby said relative rotation is possible in one direction only.

8. A closure according to either Claim 6 or Claim 7 wherein the ratchet means comprises pawl members provided on the outer crown and ratchet teeth members provided on the outer upper surface of the inner crown, or vice versa.

9. A closure according to any of claims 6 to 8 wherein the pawl and ratchet members are

each spaced an equal distanc from th ir adjacent respective members in a circumferential direction of the respective closure member.

10. A closure m mber according to any of claims 6 to 9 including five pawl members on the outer closure and ten ratchet members on the inner closure.

11. A closure member according to any one of claims 6 to 10, wherein the crown of the outer member terminates toward its periphery in an annular connecting portion connecting the crown to the skirt, said annular portion being of increased flexibility to assist axial and/or partial pivotal motion of the outer closure member.

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